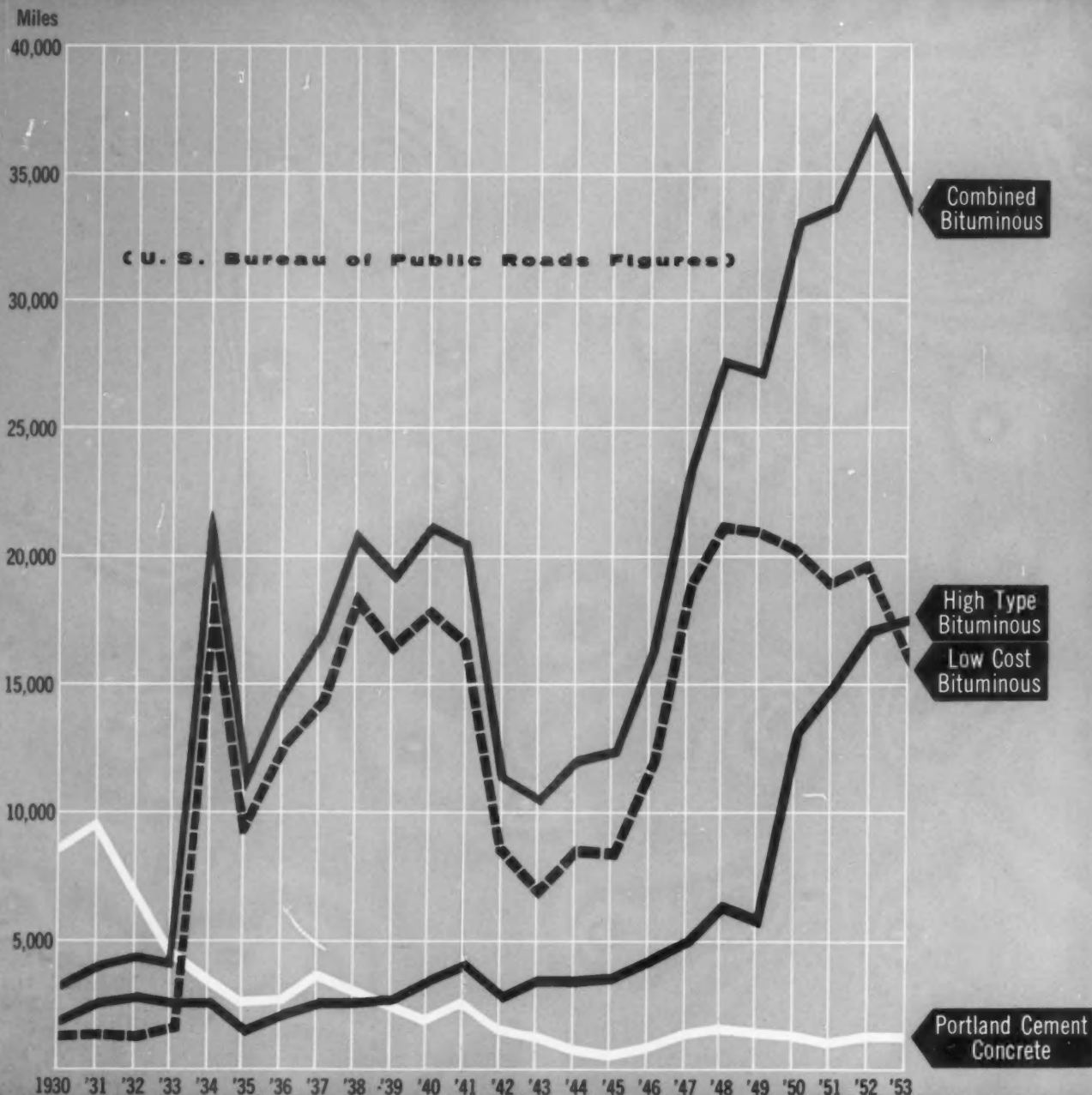


ASPHALT INSTITUTE

Quarterly

OCTOBER, 1955





Annual Mileage Constructed by State Highway Departments

There can be no doubt about the story this chart tells. The preference of the State Highway Departments for nearly 20 years has been overwhelmingly for bituminous types of paving material—and that means ASPHALT!

For the entire range of road-building—from the lightly-traveled country road to the modern superhighway carrying tens of thousands of vehicles a day—asphalt has long led the field. That it continues to do so reflects the confidence and wisdom of those engineering authorities who specify the material with which a highway is to be paved. They almost always specify asphalt because they know it makes a stronger, smoother, safer pavement than any other type, and at far less cost.

You can back up their choice by simply doing this—

WHEN YOU TALK ROADS—TALK ASPHALT

ASPHALTOPICS

One cause of headache among highway maintenance men is the farmer who trundles his heavy, cleated tractors across the pavement. In Idaho, highway department maintenance man Leslie M. Bartholomew has come up with a workable solution to the problem. He stacks old tires on stakes at every farm crossing and reports the farmers are using them for crossing mats. "It sure helps to get rid of the old boards and trash in the gutter," says Bartholomew, who finds that about ten tires per crossing will do the trick.



Smooth handling and full oscillation are several of the major features offered by a new self-propelled, pneumatic-tire 9-wheel roller, manufactured by an equipment firm in Minneapolis. The unit is particularly suitable for mat resurfacing, seal coating and compaction jobs in the shallow lift range. It has 5 front and 4 rear wheels and is equipped with uniform hydraulic steering for smooth handling at any motor or roller speed. Also, it permits easy turn-around on an 18 ft. 5 in. radius. The 9-ton compaction load is evenly distributed over the 9 wheels at 2,000 lbs. per wheel, or 255 lbs. per lineal inch of rolling width. Full 100% compaction is obtained by one-half in. overlap of front and rear tires. A 50 hp engine produces plenty of power for shallow lift compaction jobs.

One of the looming problems of the Expressway Age: highway hypnosis. Mile after mile of straightway driving can have the same effect as a chorus or two of Brahms' Lullabye. The Cook County (Ill.) Highway Department is experimenting with rough stretches of roadway approaching stop signs, the tire rumble alerting the driver to changing conditions. Coated slag, one inch in diameter, is proving the best alarm clock.



Virginia is planting trees in the center strip to break the monotony of the open highway and reduce sun glare. New Jersey's asphalt-paved Garden State Parkway, too, is specially landscaped to help prevent driver fatigue. North Carolina has broken out in a rash of attractive and cleverly worded caution signs that keep the mind of the idling tourist on the business of driving.

Did you know that asphalt pavements can be constructed to carry any weight and volume of traffic, and at far less cost?—that, for comparable traffic loads, asphalt pavements are easier and less expensive to maintain than any other pavement type. To be sure of getting the best pavement money can buy—

SPEAK UP FOR ASPHALT!

ASPHALT INSTITUTE

Quarterly

Vol. 7, No. 4, October, 1955

EDITOR

Richard C. Dresser

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Cover

This fine asphalt road in California, between Riverside and Redlands, provides motorists with a smooth, safe ride as well as a strikingly beautiful one. Through asphalt stage construction, thousands of miles of "old" roads like this have been modernized to carry the 60 million vehicles traveling our highways today. Only with asphalt could this tremendous job have been accomplished.

Photo: California Highways



The Asphalt Institute Quarterly is published by The Asphalt Institute, an international, nonprofit association sponsored by members of the industry to serve both users and producers of asphaltic materials through programs of engineering, research and education.

The Member Companies of the Institute, who have made possible the publication of this magazine, are listed on page 15.

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FROM plank road TO ASPHALT S

By F. B. Jones
District Engineer, The Asphalt Institute

ONE of the soundest of all road-building practices—one that has been proven and accepted by highway engineers everywhere—is stage construction, the process by which a road is periodically improved to meet the demands of increased traffic loads and volume. Many of our modern high-speed superhighways owe their existence to this method of construction, having been transformed through the decades from narrow, rutted overland routes, suitable for the covered wagon, the stagecoach and the surrey, into wide, smooth expressways carrying vehicles up to fifty times heavier, thousands of times greater in volume, than those of another era.

The transformation did not take place overnight. Back at the turn of the century, when the automobile began replacing the horse-drawn carriage, road authorities had to undertake programs to make highways stronger, wider and smoother to accommodate the bigger, heavier vehicle. The process has continued ever since. To keep pace with the output of automobile assembly lines, highway departments throughout the land are now engaged in bigger road improvement programs than ever before, with stage construction constituting a major item in most schedules.

Because of their inherent characteristics, flexible asphalt pavements lend themselves to stage construction far better than any other pavement type. No matter what the improvements are—whether a road is to be widened, strengthened, or smoothed—an asphalt pavement can be laid easily, quickly and at low cost with the assurance that, if properly constructed, it will adequately support, without deteriorating, the traffic loads for which it is designed.

A positive testament to the advantages of stage construction with asphalt is that section of U. S. Route 25 which covers the eleven-mile distance between Bowling Green and Perrysburg, Ohio. Its evolution from plank road to superhighway

is not only a minor saga of road-building but it also reflects the growth of industrial America and the automotive industry.

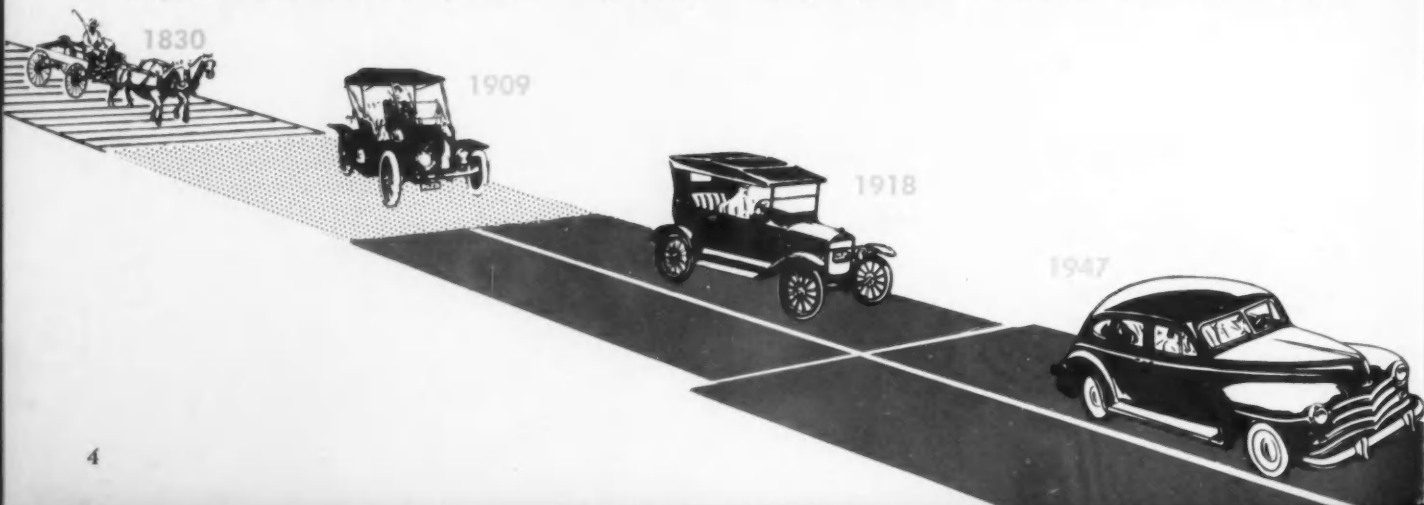
U. S. 25, extending through Toledo and Cincinnati, is the primary north-south route through the wealthy, thickly populated, and highly industrialized area of northwestern Ohio. Between Perrysburg and Bowling Green the traffic count varies from 5,800 to 8,860 vehicles daily, including a large volume of tractor-trailer units.

EARLY CONSTRUCTION

The road was born in a session of the Legislature of Ohio on the 22nd of February, 1830, when a charter for the construction and operation of a wooden plank turnpike from Bellefontaine to Perrysburg, Ohio, was granted to the Perrysburg-Findlay-Kenton Turnpike Road Company. The plank pike evidently was not as profitable an enterprise as many of our modern turnpikes, because in 1845 the portion which passed through Wood County was purchased by the Wood County Commissioners.

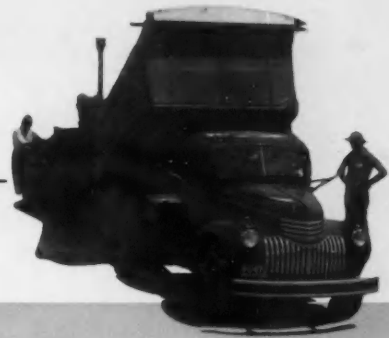
Wood County records show that small sums were allotted yearly for upkeep of the pike. In 1867, however, it must have failed beyond use for the County Commissioners ordered that "the ditches be opened and deepened to 4' depth, with a 3' bottom width and a 9' top width; that all of the old plank be removed from the road bed, and the earth from said ditches be placed on the road and rounded so as to make a good turnpike road; that the roadbed be made at least 24' wide and the ditches a bank slope of 1' to 1' vertical." The estimated cost of this project, a major construction job in 1867, was \$15,000.

Because of the flat, level topography in this area engineers today experience considerable trouble with road drainage.



SUPERHIGHWAY

STAGE CONSTRUCTION ON U. S. 25, OHIO



Photos: Ohio Dept. of Highways



This 2" asphaltic concrete pavement on U.S. 25 (Ohio) withstood the beating of heavy traffic for 30 years.



Today this main route, once a wooden plank road, is a four-lane, heavy-duty asphalt superhighway.

The following entry in the Wood County records indicates that engineers many years ago had similar problems:

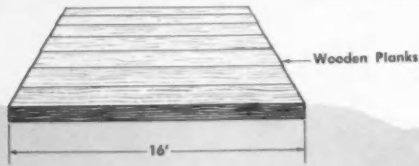
"September 6, 1872—The Board of Commissioners being satisfied that some parts of the Perrysburg-Findlay Plank road is becoming injured by timber standing so near to the edge of the road that it prevents said road from drying off and causes said road to be rutted up by travel. It is hereby ordered to cut and pile suitably for burning all timber (not considered saleable) for a width of not exceeding 50' on each side of said road and to cause all holes in road to be filled up so as to make a good road for public travel."

MACADAM PAVEMENT BUILT

For the next thirty-odd years the road was not materially changed although small sums periodically were allotted for maintenance. The industrialization of the Toledo area began and the advent of the horseless carriage became an actuality. As commercial and private travel increased, the old dirt road started to go to pieces. To keep pace with obvious trends, a "superhighway" was designed and ordered constructed, and the year 1909 saw the completion of a stone macadam road, 16' wide, for a distance of seven miles between Bowling Green and Perrysburg.

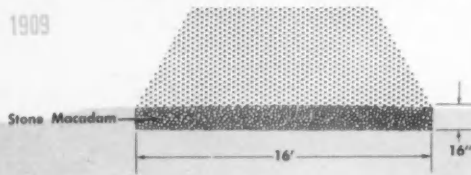
STAGES OF DEVELOPMENT

1830



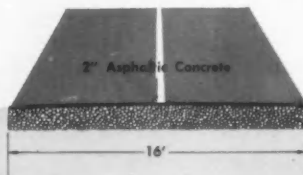
WOODEN PLANK ROAD, 1830-1867
Planks removed and dirt surface maintained, 1867-1909

1909



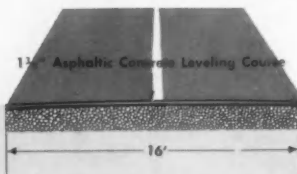
PLACEMENT OF STONE MACADAM

1918



FIRST ASPHALT COURSE LAID

1947



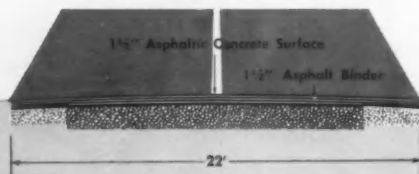
ASPHALT LEVELING COURSE ADDED

1947



ROAD WIDENED TO 22 FEET

1947



ADDITIONAL ASPHALT SURFACING OVER FULL 22' WIDTH

The original macadam (macadam is the forerunner of the modern flexible pavement) was well constructed and served for many years with little maintenance despite tremendous traffic increases. Shortly after the Ohio Department of Highways, following repeated requests by the Wood County Commissioners for aid, assumed responsibility for maintenance of the Perrysburg-Findlay-Kenton Pike, the section between Bowling Green and Perrysburg received, in 1917-18, a 2" surface of hot-laid asphaltic concrete.

Although equipment and construction procedures at that time were, by modern standards, crude, this asphalt pavement played an amazing performance. Except for periodical light asphalt surface treatments on portions of the road, and a little routine maintenance, *this rugged pavement withstood the beating of traffic until 1948—a period of thirty years.*

ADDITIONAL ROADWAY REQUIRED

By the late thirties, however, the traffic volume had surpassed the lateral capacity of this part of Route 25. The narrow roadway and deep ditches were a constant menace to travelers. In 1941 the highway department constructed a parallel roadway, 22' wide, on the south end to form five miles of divided highway. The new construction, of flexible design, consisted of a 1 3/4" stabilized sub-base course, a 6" asphaltic concrete base course, and a 2 1/2" asphaltic concrete binder and wearing course.

During the war years, the old pavement continued to serve under tremendous loads and volumes of traffic with no indications of failure. In 1947, the highway department completed the remaining 6 miles of new construction, creating a total of 11 miles of divided highway. Although this latest construction was flexible, the design differed from that of the 1941 project. The new section consisted of a 6" to 12" stabilized sub-base, 9" of waterbound macadam base course, and 3" of asphaltic concrete.

The old section at the north end also received in 1947 its first major improvement since 1917. After salvaging the old 16' pavement and giving it a new 1 3/4" asphaltic concrete leveling course, a new 6' width, consisting of a 3" asphaltic concrete leveling course over 9" of waterbound macadam, was added. Then followed the application of a 1 1/2" binder and a 1 1/2" asphalt wearing course over the full 22'-wide pavement.

COMPLETION OF LATEST CONSTRUCTION

During the following year modernization of the south portion was carried out to make a four-lane divided highway of the entire eleven-mile section, adequate to carry today's traffic. Widening to 22' was accomplished by placing a 5" insulation course and a 6" asphaltic concrete base course laid in two 3" lifts. The entire width was then surfaced with a 1 1/4" binder course and a 1" asphalt wearing course.

Completion of the 1947-1948 improvements marks the latest step in the construction of a road which grew as the area it served grew. Today, halfway through 1955, it continues to serve as a main thoroughfare, showing no signs of failure, requiring no expensive maintenance. If the traffic of the future demands even more in the way of load-carrying or vehicle volume capacity, it will be relatively simple to move up another stage to fulfill the requirements of tomorrow.



By Robert K. Williams, Jr.
District Engineer
The Asphalt Institute

North Carolina's Stage Construction Program

THE term "stage construction" is popularly applied to the methods that highway engineers use for gradually improving and modernizing an "old" road—one that has been in existence a long time. This streamlining process includes such common construction procedures as widening, improving sight distances by flattening hills and eliminating curves, and adding layers of new pavement to make the road stronger and smoother than before.

Yet the term is often applied to recent new construction. In 1952, for example, the State of North Carolina embarked on a stage construction program—not only to improve their "old" roads, but to build, in planned stages, new ones on which traffic is permitted before the final heavy-duty surface is laid. Such a process, possible only with flexible asphalt pavement construction, allows the taxpayer to reap the full benefit of his tax dollar. With this thought in mind the North Carolina State Highway and Public Works Commission undertook its well-conceived road-building program.

STAGES OF CONSTRUCTION

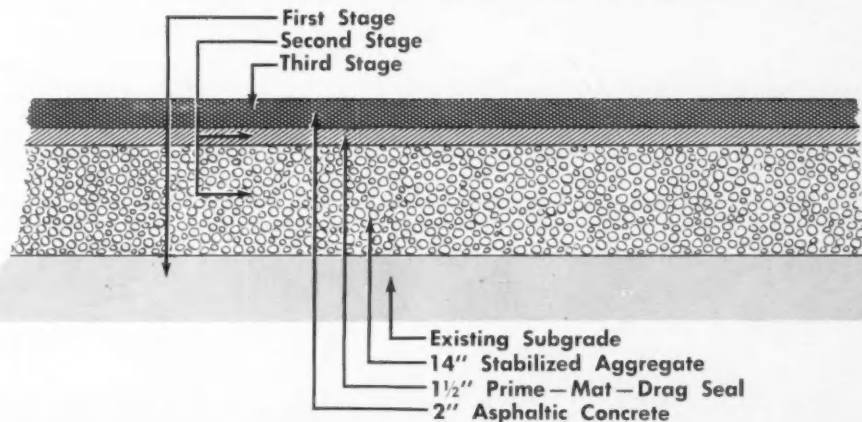
The construction in North Carolina involves three separate and distinct stages before the highway is considered complete.

After location surveys are ended and final plans prepared, a contract is let for clearing and grubbing, grading, and the building of necessary drainage structures (first stage). This phase is usually completed during one construction season. The following season a contract is awarded for the construction of a flexible-type base course with an asphalt surface treatment (second stage). Traffic is then allowed on the road for approximately two years, at the end of which period a high-type wearing surface of hot plant-mixed asphaltic concrete is applied (third and final stage). By this method more miles of highway are opened to traffic from funds available than would be possible if all three phases of construction were completed under one contract.

FLEXIBLE BASE DESIGN AND CONSTRUCTION

Base Course.—The stabilized aggregate base course material used in North Carolina, thickness requirements for which are determined by the testing laboratory, is a blend of coarse and fine aggregate mixed in a pugmill at optimum moisture content. This type of base has an excellent performance record in the state and can be designed to support any desired wheel load. The maximum size of the aggregate is 2".

STAGES OF CONSTRUCTION



An average of 14" compacted depth is the normal design thickness for primary highways. The base is constructed in layers of maximum thicknesses to obtain a density of 100%. Ring or tamping rollers and pneumatic-tired rollers compact each layer. During compaction motor graders continuously machine the base course material to maintain the desired typical section until final compaction. A broom drag is also used in conjunction with the other equipment, with water added when necessary to secure proper conditioning.

Mechanical spreaders are used to apply the base material. Furnishing the material to the spreader at optimum moisture content aids in reducing segregation of the aggregate. It is the general practice to include in the top course seven pounds of calcium chloride per ton of mix. The calcium chloride, however, is eliminated late in the construction season if it is decided that its addition would cause a delay in applying the prime and surface treatment.

Prime Treatment.—After the base course has been thoroughly compacted and brought to the desired typical section, the surface is cleaned of loose material and freed of moisture in preparation for the prime treatment. The prime consists of medium-curing cutback asphalt (MC-O) applied by pressure distributor at the rate of 0.2 gallon per square yard. (When calcium chloride is eliminated in the top 3" of the base course, the rate of MC-O is increased to .35 gallon per square yard.) If it is necessary to maintain traffic over the primed section, a light protective coating of granular material is applied. The prime coat is maintained in a firm condition for a curing period of not more than ten days.

Mat Course.—Placed atop the prime, the mat course consists of an asphalt cement (150-200 penetration) or a high viscosity emulsified asphalt applied at the rate of 0.4 gallon per square yard, and a 1½" cover aggregate spread at the rate of 45 pounds per square yard. The material is uniformly applied by mechanical spreader and broomed to obtain even distribution over the entire mat. Rolling with a power roller begins within a half hour after placement of the asphalt. When the aggregate has become sufficiently embedded in the asphalt, loose cover material is removed from the surface, an operation that is performed no earlier than the following day after application. The mat course is then allowed to cure for five days.

Seal.—The seal coat requires two separate applications of asphalt. The construction steps are (1) placement of 0.15 gallon per square yard rapid-curing cutback asphalt (RC-2) or high viscosity emulsified asphalt, (2) spreading a ½" cover aggregate (26 pounds per square yard), and (3) another application of RC-2 or emulsified asphalt at the rate of 0.25 gallon per square yard. Immediately following the latter application, the asphalt and seal aggregate are mixed with a long base broom drag until the aggregate is thoroughly coated with asphalt. Then the remainder of the seal aggregate is uniformly applied (5 pounds per square yard) as a choke course and the surface rolled until the aggregate is properly set. This completes the second stage of construction. As soon as the seal course has cured sufficiently to prevent the aggregate from adhering to automobile tires, the barricades are removed and traffic is allowed on the road.

ASPHALTIC CONCRETE WEARING SURFACE

The final stage of flexible pavement construction begins after the road has served under traffic for about two years.

Finishing machines lay in one course 200 pounds per square yard of laboratory designed and controlled asphaltic concrete. This completes the project and readies the roadway for years of rugged service, providing for motorists safe, smooth and dependable travel.

Since North Carolina began its stage construction program three years ago, three hundred miles of stabilized aggregate with a prime, mat and seal course have been completed or are under construction. This mileage includes both single and dual lane roadways, each lane having a width of 24.5 feet. In addition, asphalt construction has been employed in widening over fifty miles of old pavement. Asphaltic concrete surfacing has also been placed on fifty miles of stabilized aggregate which had been previously surface treated. Of this mileage, there are twenty-one miles of dual lane construction.

Moreover, twenty-one miles of stabilized aggregate used for widening old pavements have been surfaced with asphaltic concrete. As approximately ten miles of this widening were not surface-treated prior to placing the hot-mix, it received both a binder and surface course.



DOLLARS SAVED WITH ASPHALT CONSTRUCTION

The savings realized by employing the stage construction method in North Carolina have been tremendous. On two projects, each about 16½ miles in length, where alternate bids for flexible asphalt and rigid concrete construction were taken, the asphalt savings amounted to approximately \$230,000 and \$435,000, respectively. Yet, the low cost of construction is only one of the advantages of asphalt paving. The asphalt surface treatment applied to the stabilized aggregate base affords a wearing course, requiring no maintenance, that traffic can use for several years. At the same time, it provides an excellent binder course for ultimate construction of the heavy-duty asphaltic concrete wearing surface which, when placed, adds many, many more years of service life to the highway. If, far in the future, it should become necessary to strengthen the pavement to accommodate greater volumes of heavier traffic, a new surface of asphalt mix can be quickly and easily laid.



Pugmill mixes the aggregate for base course.



Spreaders lay base aggregate in three lifts.



Rubber-tire rolling prepares base course for asphalt surface treatment.

ASPHALT STAGE CONSTRUCTION CONSERVES THE TAX DOLLAR

Asphalt prime, mat and seal coats in place and ready for traffic.



Vehicles are permitted on surface-treated base for two-year period. Placement of heavy-duty asphaltic concrete pavement follows.



Built in three stages, this sturdy asphalt highway provides motorists with smooth, comfortable, safe riding.





Photos: Oregon State Highway Dept.

U. S. Route 99, two miles south of Drain, Oregon, as motorists traveled it in the 1920's.

ANOTHER *Oregon* TRAIL

By Rodney P. Ryker
District Engineer, The Asphalt Institute

The same road today, its asphalt pavement still providing top service for heavy traffic after 33 years.



THE State of Oregon is a neat and orderly community of Americans. Waste and profligacy are strangers in the land. Here, the great stands of Douglas fir have been as zealously cultivated and pruned as the tidy little rose gardens that are the pride and joy of the typical Oregon householder.

This measured growth has marked the history of highway development in the state. Tough-minded and realistic, the highway builders of Oregon have dealt with the land as they found it and have managed the state's transport problem with patience and sanity.

Back in 1922, in its fifth biennial report, the Oregon State Highway Commission declared "no one type of pavement is the best pavement, and no one type can be used under all conditions.

"A fact that seems to be little appreciated is that the problem in road surfacing is not the problem of constructing a pavement which will successfully carry the traffic to which it will be subjected, but instead, it is the problem of determining the absolute minimum thickness, strength, width and cost with which a pavement can be constructed and still stand up under the traffic for a long period of time. *It is not at all difficult to build a pavement that will carry the load and have the desired length of life, but it is difficult to build such a pavement when the cost must be kept within the limits of what the public can afford to pay . . .*"

LARGE ASPHALT PAVING PROGRAM

The report concluded with the observation that the commission had just completed an ambitious paving program that had surfaced more than 200 miles with asphalt at a cost of approximately \$25,000 per mile. Another 75 miles had been paved with concrete at a cost of about \$2,500 more per mile.

Included in that paving program was an 8.6 mile stretch of U.S. 99 where it winds up out of the Umpqua Valley and worms its way through the Douglas fir country to continue its northward course along the rich Willamette Valley.

This section of U.S. 99 between Drain and Yoncalla serves Oregon's heaviest flow of interstate traffic, travelling between California and Washington. To this volume of "corridor" traffic can be added the huge platform trailers that haul the great fir logs to the sawmills and riverports.

In the summer of 1922 this highway was surfaced with five inches of asphalt pavement on a heavy six-inch macadam foundation. The width of the road was 16 feet and the plant-mix asphalt was laid in two courses, a three-inch base course and a two-inch wearing course.

With routine maintenance, this 33-year-old asphalt pavement is continuing to serve Oregon's "lifeline of development." Two years ago the Oregon State Highway Department added two-foot asphalt shoulders, extending the width of the highway to a safer twenty feet. But the original pavement is today carrying an average daily traffic flow of 4,500 vehicles, including many heavy trucks.

33-YEAR INVESTMENT CONSERVED

On U.S. 99 where it skirts the western foothills of the Cascade Range, the Oregon Highway Commission has served its role of trustee. A 33-year-old highway is continuing to return daily dividends on a calculated total investment of only \$25,000 per mile. And as the volume of traffic increases on this Oregon artery, the highway is prepared to grow with it.

Oregon's canny 1922 investment in asphalt paving will continue to draw interest in perpetuity.



Drive Up to the Golden Gate on Asphalt

By C. J. Van Til

AS part of a project to ease toll booth traffic jam-ups at San Francisco's famed Golden Gate Bridge and to permit more efficient handling of large volumes of motor vehicles on the span itself, a half-mile of portland cement concrete on the San Francisco approach has been widened and resurfaced with asphalt. The improvements were completed in July, 1955.

The approach, finished in 1939 when the bridge was opened to traffic, formerly consisted of six 10-foot lanes which flared out rather abruptly to meet the 210-foot width of the 14 gates at the toll plaza. As traffic increased through the years, the shortness of the flared section began more and more to interfere with the effective distribution of both northbound and southbound traffic to and from the toll booths. Merging traffic from an on-ramp in the northbound lane aggravated the congestion.

CONCRETE IN BAD CONDITION

The portland cement concrete pavement on the approach had deteriorated rapidly during the past several years. Faulted and pumping joints were numerous, and some slabs were so badly cracked that they had to be removed. The result was that the motorist was getting a very rough ride, as well as a crowded one.

To alleviate the situation the Golden Gate Bridge and Highway District reached an agreement with the California Division of Highways to design and supervise reconstruction of the approach, and on July 21, 1954, bids were received for the improvements. The major construction items included: (1) drilling holes and undersealing the old concrete pavement with asphalt; (2) widening two approach bridges; (3) constructing three additional traffic lanes and greatly increasing the length of the flared section at the toll plaza; and (4) surfacing both the old pavement and the new concrete base used in the widening with four inches of hot-mix asphalt placed in two courses.

STRENGTHENING AND SMOOTHING WITH ASPHALT

The amount of asphalt required for undersealing was originally estimated at 100 tons. When work began, however, it was discovered that the voids under the concrete were so large and numerous that by the time the job was completed 260 tons of asphalt had been pumped under the slabs.

After the time-consuming operation of widening the lanes (no traffic could be allowed on the portland cement concrete base until placing, finishing, and curing had been completed), paving machines placed the asphalt surfacing in the center lanes. During this construction traffic proceeded on the

outer lanes with little inconvenience. When the asphalt had been laid in sufficient width, traffic was directed over the center lanes while the outer ones were completed. Although both the leveling and wearing courses were rolled with a steel-wheeled tandem roller, further compaction was obtained by routing traffic over the newly completed pavement at the end of each working day.

The latter procedure is one of the typical advantages of asphalt paving, benefiting both the highway builder and the motorist. Far from ever harming the pavement, the rolling, rubber-tired wheels of traffic on a newly-paved asphalt road actually *improve* the condition of the surface. And traffic can be allowed on an asphalt surface almost as soon as the spreading machines finish laying the hot asphalt mix.

Here placement of asphalt leveling course has been started on Golden Gate Bridge approach.



While new asphalt pavement construction took place on center lanes, traffic was routed to either side.



New traffic glides smoothly up to the bridge toll gates on a rugged new asphalt surface.



Bridgework . . . With AS

THERE is a growing recognition among structural engineers of the special advantages of asphalt-surfaced bridge decks. More and more designs are calling for this type of flooring. In most cases, the asphaltic mat is laid over a steel or concrete foundation necessary for load transfer purposes.

Typical of the newer asphalt-paved spans is the mile-long Bay Bridge which crosses the Chesapeake Bay at Annapolis. Several of the Delaware River bridges and some of the Hudson River crossings also are paved with asphalt.

The smooth, joint-free ride has been found to contribute to a sense of confidence in the timid driver on these over-water spans. This, of course, becomes an important safety factor. In addition, many motorists find a special aesthetic quality in the asphalt pavement, a dark ribbon spun on a framework of white masonry.

The rising popularity of asphalt floorways on bridges can be traced to the experimental use of asphalt for resurfacing cracked and worn concrete pavements. This is now common

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The old, worn concrete having been removed from New York City's Bronx-Whitestone Bridge, paver places new 2" layer of asphaltic concrete. One lane, at left, is already complete.



Traffic was maintained throughout the resurfacing project, an advantage afforded only by asphalt paving.

h ASPHALT "INLAYS"

practice and a splendid example is the Bronx-Whitestone Bridge which connects Long Island with New York City's northernmost borough.

This span was constructed originally with a concrete deck, but the pounding of heavy traffic proved too great a burden for the surface. Cracking and spalling became so pronounced that, in 1954, the bridge flooring was beyond further patching with asphalt. It was decided to resurface the entire bridge, from tower to tower, with two inches of dense asphaltic concrete.

The Tri-Boro Bridge and Tunnel Authority solicited the Asphalt Institute's views and it was recommended that the top section of the existing concrete be removed down to the steel reinforcing grid. This steel grid, it was pointed out, would provide an excellent bond for the asphalt wearing course.

The Authority, acting on this advice, laid the two-inch wearing course during July, 1954. The accompanying pictures illustrate construction features and the new-ride quality of the asphalt surface.

THE BERNARD E. GRAY FELLOWSHIP

At The University Of Maryland
College Park, Maryland

Sponsored by

THE ASPHALT INSTITUTE



For the purpose of assisting in the support of a student undertaking graduate study and research work in asphalt technology leading to a Master's degree, the University of Maryland offers to graduate engineers the Bernard E. Gray Fellowship,

sponsored by The Asphalt Institute and named for the noted highway engineer and former President of the Institute, now retired.

The Fellow will be appointed for a two-year period commencing either on September 1 or February 1. The stipend is \$1,500 per year, payable in ten monthly installments. The appointee will register in the Graduate School of the University of Maryland. Work will be scheduled so that the Fellow's time will be divided between study of selected and approved courses and research on appropriate problems in asphalt technology, particularly the engineering uses of asphaltic materials. Laboratory facilities at College Park of both the University of Maryland and The Asphalt Institute will be available as needed. The faculty adviser will be the Dean of the College of Engineering of the University assisted by the Engineer of Research of The Asphalt Institute.

Completion of the work leads to the degree of Master of Science. The Fellowship is open to qualified graduates in engineering from accredited colleges and universities. Those interested in becoming candidates may obtain application forms by writing to the Dean of the Graduate School, University of Maryland, College Park, Maryland.





B. B. FREEBOROUGH
District Engineer at Austin

WITH a territory that covers the entire State of Texas, B. B. Freeborough holds the District Engineer post of The Asphalt Institute in Austin. His office is located in the Littlefield Building.

A native Texan, Ben Freeborough has devoted his life to highway construction in that State. His long and distinguished career with the Texas Highway Department, which ended when he joined The Asphalt Institute 18 months ago, was marked by many accomplishments. Perhaps his most outstanding achievement was the organization and supervision of the Department's Land Service Roads Division which, since its creation in 1945, handled millions of dollars and thousands of miles of important farm-to-market road construction. Among his several earlier engineering capacities with the Department, he held the position of Inventory Manager of the Texas Highway Planning Survey where he organized and supervised, in 1936, the road inventory section.

Mr. Freeborough holds membership in the American Society of Civil Engineers and has been an active member of the Highway Research Board and the American Association of State Highway Officials.



F. B. JONES
District Engineer at Columbus

SINCE joining The Asphalt Institute in April, 1954, District Engineer Frank B. Jones has served the Ohio Valley-Great Lakes area from the Institute Division office in Columbus, Ohio.

Although graduated from Ohio State University with a C.E. degree in 1948, Barney Jones' engineering career actually began ten years before when he learned about asphalt highway construction while working with the Wood County (Ohio) Engineers' office. He shifted to aircraft in 1941 as an assistant to the Planning Engineer of Thompson Aircraft Products in Cleveland and during World War II he was an Army Air Force pilot instructor. After serving with the Ohio Department of Highways as a Design Engineer in 1948 and 1949, he became a superintendent for a general highway contractor in West Virginia, supervising flexible pavement construction in all its phases. He relinquished this position to accept his present post with The Asphalt Institute.

Mr. Jones is a member of the Association of Asphalt Paving Technologists and the American Society of Professional Engineers.

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